

## The influence of antioxidants on the properties of rubber based on butadiene-nitrile caoutchouc

© Marina S. Illarionova, Nikolay F. Ushmarin,  
Margarita A. Kapitonova, and Nikolay I. Koltsov\*<sup>†</sup>

Department of Physical Chemistry and Macromolecular Compounds. Chuvash State University  
of I.N. Ulyanov. Moskovsky ave., 15. Cheboksary, 428015. Chuvash Republic. Russia.

Phone: +7 (8352) 45-24-68. E-mail: koltsovni@mail.ru

\*Supervising author; <sup>†</sup>Corresponding author

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### Abstract

The article is devoted to the problem solution of increasing thermo-resistance of rubber-technical products based on butadiene-nitrile caoutchoucs. It is known that during the operation under the influence of oxygen of air, hydrocarbon media and temperature aging of rubber products occur. To increase the resistance to oxidative degradation and the durability of rubber products, antioxidants are introduced into the composition of rubber compounds. Amine and phenolic compounds are used as antioxidants where the most effective ones are amine compounds. Peroxide radicals are formed at oxidative destruction of rubbers. Antioxidants together with peroxide radicals form hydroperoxide macromolecules which are sources of free radicals that contribute to oxidative degradation of the rubber. Dithiocarbamates of divalent metals can be used to decompose hydroperoxides. Divalent metal dithiocarbamates decompose hydroperoxides to form stable molecular compounds and prevent the aging of rubbers. Due to this it is of interest to investigate the influence of various amine combinations of antioxidants with nickel dibutyldithiocarbamate on the properties of rubbers based on butadiene-nitrile caoutchoucs. The possibility of using as an antioxidant 6PPD combinations of Novantox 8PFDA, Kvalistab 8PFDA, diafen FP with nickel dibutyldithiocarbamate in rubber on the base of butadiene-nitrile caoutchoucs BNKS-18AMN and BNKS-28AMN with sulfuric vulcanization system has been studied in this paper. Plasto-elastic and rheometric properties were studied for rubber composition, physical and mechanical properties were studied for vulcanizates, hardness by Shore A, resistance to thermal aging and to the action of corrosive media. According to the performed studies it has been found out that vulcanizates of rubber mixture containing as antioxidants combinations diafen FP, 6PPD with nickel dibutyldithiocarbamate possess the best plasto-elastic, rheometric, physical-mechanical and performance properties.

### References

- [1] S.M. Kavun, Yu.V. Vinokurov, V.G. Frolikova, N.F. Ushmarin, L.F. Manaeva. Novantox P (Powder) - Prospects for the Use of the Antioxidant Rubbers in the Manufacture of Rubber and Tires. *Mir tire*. **2008**. No.9. P.19-24. (russian)
- [2] L.I. Sergunova, R.I. Kabitova, A.A. Dontsov, I.P. Kotova. Influence of temperature on aging of rubber from BNC in fuel. *Production and use of Elastomers*. **1990**. No.9. P.20-23. (russian)
- [3] N.I. Kol'tsov, N.F. Ushmarin, A.E. Petrov, N.P. Petrova, N.N. Petrova, S.M. Verkhunov. Investigation of the influence of technological additives on the properties of rubbers based on BNK of a new generation. Part 3. Novantox 8 PFDA. *Butlerov Communications*. **2010**. Vol.21. No.9. P.22-28. ROI: jbc-02/10-21-9-22
- [4] N.I. Kol'tsov, N.F. Ushmarin, L.G. Rogozhina, S.A. Issakova, A.V. Yarutkina, A.Yu. Plekhanova, M.V. Kuzmin. Investigation of the influence of technological additives on the properties of rubbers based on BNK of a new generation. Part 4. Powder stabilizers based on Novantox 8 PFDA. *Butlerov Communications*. **2010**. P.22. No.10. P.42-50. ROI: jbc-02/10-22-10-42
- [5] S.I. Sandalov, N.F. Ushmarin, N.I. Kol'tsov. Application of Novantox 8 PFDA as an antioxidant in the production of rubber products. *Rubber and Rubber*. **2010**. No.3. P.32-36. (russian)
- [6] S.I. Sandalov, N.F. Ushmarin, M.S. Reznikov, N.I. Kol'tsov. Investigation of the effect of coagents of

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vulcanization and aging stabilizers on heat and resistance resistance of rubbers based on BNK. *Rubber and Rubber*. **2013**. No.1. P.12-14. (russian)
- [7] B.A. Dogadkin, A.A. Dontsov, V.A. Shershnev. *Chemistry of elastomers*. Moscow: *Chemistry*. **1981**. 376p. (russian)